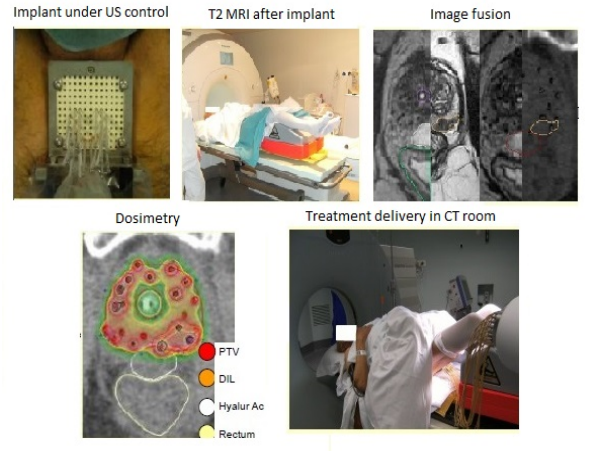
**Purpose/Objective:** Local failures after external beam radiotherapy (EBRT) are frequent at the site of the original dominant intraprostatic lesion(DIL). The concept of dose painting of dominant intraprostatic lesion (DIL) using a multiparametric MRI-guided HDR brachytherapy (HDRBT) for a synchronous simultaneous boost was applied as a strategy for tumor dose escalation. Our proposal is to analyze the dosimetric goals for CTV or prostate+extracapsular extension+3mm margins, for DIL, conformity index and organs at risk (OAR).

**Materials and Methods:** We have analyzed the dosimetric studies of 8 patients with intermediate and high risk prostate cancer treated with MRI-guided HDRBT 15Gy single fraction and hypofractionated volumetric modulated arctherapy 37.5Gy in 15 fractions.

Brachytherapy included ultrasound guided catheter insertion, hyaluronic acid in Denonvilier space and the treatment planning was based on rigid image fusion of staging mpMRI, postimplant T2 sequence MRI and CT planning. The DIL, CTV and OaR were contoured and dosimetric parameters for DIL, CTV and normal tissues were analyzed.




**Results:** The average prostate V100% and D90, DIL V125%, urethra $D_{0,1cc}$, bladder $D2_{cc}$, and rectum $D2_{cc}$ have been assessed.

| Dose parameters | PTV ∑Dose [%] | CTV ∑Dose [%] | DIL ∑Dose [%] | Volume (cc) | Urethra ∑Dose [%] | Rectum ∑Dose [%] | Bladder ∑Dose [%] |
|---|---|---|---|---|---|---|---|
| V100 | 94,2±2,9 | 99,9±2,1 | -- | 0,1 | 118,1±1,3 | 84,4±1,7 | 84,3±1,9 |
| D90 | 99,5±4,3 | 118,1±3,3 | -- | 1 | 109,9±2,4 | 72,9±2,2 | 71,9±2,3 |
| V125 | -- | -- | 95,6±2,6 | 2 | 103,2±2,9 | 67,9±2,3 | 70,0±3,9 |
| COINc1 (PTVref/PTV) | | | | 0,97±0,05 | | | |
| COINc2 (PTVref/Vref) | | | | 0,74±0,02 | | | |
| COIN (c1 x c2) | | | | 0,71±0,04 | | | |

The inclusion of MRI information allows to administer a synchronous integrated boost to the DIL while dose in the remaining prostate can be decreased, keeping a substantial dose to guarantee high tumor control probability and simultaneously allows to spare the OAR.

**Conclusions:** The treatment planning of HDRBT guided by mpMRI image registered with postoperative T2-sequence MRI and CT in localized prostate cancer seems to be an attractive, effective and safe strategy for detecting and localizing cancer within prostate and to allow accurately dose escalation of the DIL without compromising the prostatic dose coverage or the sparing of the urethra, rectum and bladder.

**PO-1045**

**Dosimetric impact of uncertainty in the reconstruction of needles in HDR prostate**

R. Colmenares[1], A. Polo[2], A. Hervás[2], R. Morís[1]
[1]*Ramón y Cajal Hospital, Medical Physics, Madrid, Spain*
[2]*Ramón y Cajal Hospital, Radiation Oncology, Madrid, Spain*

**Purpose/Objective:** The correct quantification of the uncertainties associated with the radiation process is part of the normal procedures for external radiation therapy. However, in the area of brachytherapy this concept is less developed in practice, and it is usually underestimated arguing that applicators, if moving, they would do it in solidarity to the tumor. This explanation does not consider the possible impact on other organs or other sources of uncertainty. In the HDR prostate technique, a correct identification of the tips of the needles in ultrasound imaging is key to limiting the dosimetric discrepancies between the plan and reality. At our institution, an isotropic margin of 3mm on the prostate is applied except in the rectum direction. On this PTV an inverse optimization is performed with a 3 mm dwell step resolution and allowing the source to stop only within the PTV. After approval of the plan the patient is treated in a HDR unit with a $^{60}$Co source.

To evaluate the goodness of the margin is the aim of this work

**Materials and Methods:** To assess the level of accuracy of a method that does not apply a corrective action, an implant of a prostate phantom was performed under exactly the same conditions of a real implant . An implant type was performed on a prostatic phantom trying to locate all tips in the same plane, for later acquire a 1mm resolution CT study in order to assess the real situation of the needles with respect to the organs. The actual positions of the tips of the 15 needles were measured in the CT scan, obtaining the histogram and then adjusted to a normal distribution. Assuming that in a real treatment, the probability of errors in identifying the ends follow this Gaussian, deviations were randomly drawn in 5 patients (preliminary) to quantify the dosimetric deviations on the representative dosimetric parameters for prostate , PTV, rectum and urethra.

**Results:** Normal distribution: μ=0mm; s= 2.12 mm

The differences between the plans that contain all the tips in the same plane and subjected to deviations are summarized in the following chart

| PTV | D100 | D99 | D90 | V200 | V150 | V100 | V95 |
|---|---|---|---|---|---|---|---|
| Mean (%) | 0.24 | -0.41 | -0.68 | 0.05 | -0.11 | -0.60 | -0.57 |
| SD (%) | 2.66 | 1.23 | 1.30 | 0.25 | 0.75 | 1.18 | 1.09 |

| Prostate | D100 | D99 | D90 | V100 | V95 | V150 | V200 |
|---|---|---|---|---|---|---|---|
| Mean (%) | 1.45 | 0.41 | 0.31 | 0.15 | 0.32 | 0.29 | 0.26 |
| SD (%) | 1.71 | 1.16 | 1.40 | 0.14 | 0.61 | 1.26 | 1.17 |

| Urethra | D1% | D2% |
|---|---|---|
| Mean (%) | 1.52 | 0.60 |
| SD (%) | 1.00 | 0.77 |

| Rectum | D2cc | D1cc | D0.1cc |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Mean (%) | 0.58 | 0.15 | 0.39 |
| SD (%) | 0.98 | 0.08 | 0.38 |

**Conclusions:** The small differences allows us to state that the safety margin is adequate for a safe treatment. However, a more precise feedback to the TPS would be appropriate to reduce this margin of 3 mm.

**PO-1046**

**Quantification of dosimetric uncertainty in patients treated with brachytherapy in localized prostate cancer**

A. Garcia[1], M. Ferri[1], J. Anchuelo[1], J. Sanchez[1], J. Cardenal[1], G. Payá[1], P.J. Prada[1]
[1]*Hospital Universitario Marqués de Valdecilla, Radiotherapy, Santander, Spain*

**Purpose/Objective:** The aim of this study is to quantify by MOSFET dosimetry techniques in vivo dosimetric uncertainties in patients undergoing treatment with radical intent brachytherapy high dose rate prostate organ-confined at different levels of the prostatic urethra cancer and the anterior face of the rectum.
**Materials and Methods:** A strip with five micro MOSFET (Best Medical Canada) was introduced through a urethral catheter, performing simultaneous dose measurements at five points along the prostatic urethra: the first in the bladder wall, the second in the middle of the prostate gland, the third toward the apex, the fourth in the bulbar urethra and the fifth away from the others.We also placed simultaneously two micro MOSFET 2 cm apart from each other on the anterior rectal wall using an endotracheal tube sealed at its end. Finally, we planned the treatments with Prostate Oncentra® treatment planning system, creating dose points at the positions identified above and comparing the results obtained with the measurements. Between November 2013 and May 2014, we performed 29 measurements in 23 patients with localized prostatic adenocarcinoma, 18 of them made with rectal protection using hyaluronic acid.
**Results:** The differences between the MOSFET measurements and the calculated doses were between 0.34% and 21% with a standard deviation ranging from 1 to 19%.
**Conclusions:** The in vivo dosimetry technique used in our study with MOSFET to measure the doses delivered to the urethra and the anterior perirectal fat can be used to identify patients with an increased risk of treatment complications and possibly modify the implantation procedure.

**PO-1047**

**Late G3 toxicity in prostate cancer patients treated with escalated dose (ED) technique: technical dependence**

S. Rodriguez Villalba[1], M. Santos Ortega[1], J. Richart[1], A. Otal[1], M. Depiaggio[1], J. Perez Calatayud[2], F. Ballester[3]
[1]*Hospital Clinica Benidorm, Radiotherapy Department, Benidorm, Spain*
[2]*Hospital Clinica Benidorm/Hospital la Fe, Radiotherapy Department, Benidorm/Valencia, Spain*
[3]*Department of Atomic Molecular and Nuclear Physcis, University of Valencia, Valencia, Spain*

**Purpose/Objective:** A retrospective analysis in 489 consecutives prostate cancer patients have been made, for evaluating the toxicity of different multimodality radiotherapy approaches for organ confined prostate cancer in one single Institution with ED in different risk groups.
**Materials and Methods:** From September 2004 to December 2011, we have treated in our Department in a curative attempt 489 patients. We have excluded of this analysis 30 patients with recurrences after radical prostatectomy, and 177 patients without personal follow-up. The rest, 282 patients has been the target of the present study. Our protocol has been designed according to uniformity on the risk classification of prostate adenocarcinoma with ED. That's included external radiotherapy (EBRT)(72.00 Gy) 18 pts, or Low dose rate Brachytherapy LDRBT (145/160 Gy) 59 pts in low risk (LR) patients, IMRT-IGRT (75.60 Gy) 21 pts or combined treatment (3D-EBRT over prostate and seminal vesicles, 45 Gy + LDRBT (100/108 Gy) 83 pts in intermediate risk (IR) patients, and IMRT-IGRT (79.20 – 81 Gy) 52 pts or combined treatment (IMRT over pelvis 50.40 cGy and High dose rate brachytherapy 2 x 9.5 Gy (HDRBT) 49 pts in high risk (HR) patients. Median age of the whole group was 71 years (range 46-87 y). Median PSA was 9.74 ng/ml (range 2.5-500 ng/ml). Median Gleason 6 (range 2-10). In 191 pts (68%) a MRI for staging was made.
**Results:** At the time of this analysis, the median follow up was 50 months (range 3-112 mo). Cause specific survival was 98%. Local control was achieved in 271 pts (96%). Biochemical control 272 pts (96.5%). We have evidenced lymph node failure in 7 pts (2.5%). Distance failure in 17 pts (6%). Late GI toxicity has been evaluated following the CTCVA 4.0 criteria and it is represented in Table 1: Median time for GI toxicity was 11 months (1-40 months). Median time for GU toxicity was 2 months (1-48 months). All patients with rectitis G3 were treated with EBRT (3D or IGRT). Eight of them have received more than 79.20 Gy.

| **GENITOURINARY (GU) TOXICITY GRADE 3** | **#** | **TREATMENT** |
|---|---|---|
| **Hematuria** | 3 p (1.1%) | 2 p IGRT and 1p with 3D+ LDRBT |
| **Cystitis** | 1p (0.4%) | IGRT |
| **Urinary obstruction** | 2p (1.1%) | LDRBT |
| **Urethral stenosis** | 4p (1.4%) | 1p IGRT and 2p 3D + LDRBT |
| **Increased of the urinary frequency** | 2p (0.7%) | 1p IGRT and 1p 3D + LDRBT |
| **Urinary retention** | 1p (0.4%) | IMRT + HDRBT |
| **GASTROINTESTINAL (GI) TOXICITY GRADE 3** | | |
| **Diarrhea** | 1p (0.4%) | IGRT |
| **Rectitis** | 19 p (7%) | 4 p 3D/ 15 p IGRT |

**Conclusions:** In our experience, combination modalities with BT techniques escalating dose achieve more intensity treatments with high rate for both local and biochemical control a cause specific survival, with lesser toxic events, mainly related to gastrointestinal damage.